LinguaEducare: Journal of English and Linguistic Studies
ISSN: 3064-0547 (e)
2024, Vol. 1, No. 2, page 83-96
https://journal.ciptapustaka.com/index.php/LEC

OPEN ACCESS

Enhancing Writing Proficiency through AI-Powered Feedback: A Quasi-Experimental Study Using Google Gemini

Kartika S

Faculty of Sharia, UIN Raden Intan Lampung, Indonesia

ABSTRACT

The use of Artificial Intelligence (AI) in education has gained attention for its potential to enhance student learning, yet limited research has focused on AI-powered tools for providing comprehensive feedback on writing. Most existing studies have concentrated on grammar correction, leaving a gap in understanding how AI can support broader writing development. This study aimed to examine the effect of Google Gemini, an AI-powered chatbot, on writing proficiency in a higher education setting, focusing on grammar, vocabulary, coherence, and task achievement. A quasi-experimental design was used with two groups of 40 students from the Sharia Faculty at UIN Raden Intan Lampung. The experimental group used Google Gemini for writing feedback, while the control group received traditional instruction. Both groups completed pre- and post-test writing tasks, assessed using a standardized rubric. Data were analyzed with paired-sample t-tests to compare improvements between groups. The results showed that the experimental group made significantly greater gains in writing proficiency than the control group, especially in grammar, vocabulary, and coherence. Students in the experimental group also reported higher satisfaction with the immediate, personalized feedback from the AI chatbot. The control group showed modest improvements with traditional feedback, but these were less pronounced. This study suggests that AI tools like Google Gemini can effectively improve writing skills by offering real-time, personalized feedback. It highlights the potential for AI to complement traditional teaching methods, though future research with larger and more diverse samples is needed to explore its impact on higher-order writing skills and across various educational contexts.

ARTICLE INFO

Keywords:
Artificial Intelligence;
Chatbot;
Google Gemini;
Writing Proficiency;

Article History:
Received: 24 October 2024
Revised: 20 November 2024
Accepted: 25 November 2024
Published: 26 November 2024

How to Cite in APA Style:
S, K. (2024). Enhancing Writing Proficiency through AI-Powered Feedback: A Quasi-Experimental Study Using Google Gemini. *LinguaEducare: Journal of English and Linguistic Studies, 1*(2), 83-96.
https://doi.org/10.63324/h6q1ak58

Introduction

In recent years, the integration of technology into education has led to a paradigm shift in teaching methods worldwide. One area where technological advancements have had a profound impact is in language learning, particularly with the rise of artificial intelligence (AI) (Hastomo et al., 2024). AI has proven to be a transformative tool in many educational contexts, offering innovative approaches to

* Corresponding author: Kartika S kartika@radenintan.ac.id

teaching and learning (Narayan, 2024). Among the various AI applications in education, AI-powered chatbots have gained considerable attention as they present opportunities for interactive, personalized learning experiences (Oktarina et al., 2024). These chatbots are designed to simulate real-time conversations with learners, providing them with immediate feedback, suggestions, and guidance. One such advanced AI chatbot is Google Gemini, which has shown great potential in various domains, including language learning (Waziana et al., 2024). This study aims to explore the effectiveness of using Google Gemini as an AI chatbot to enhance writing proficiency among university students.

Writing proficiency is one of the most challenging aspects of language learning, particularly for second language (L2) learners. In Indonesia, where English is taught as a foreign language, students often struggle with academic writing, which demands a high level of grammatical accuracy, coherence, vocabulary, and writing fluency (Ramadhanti et al., 2024). The traditional methods of teaching writing in the classroom—usually involving teacher-centered lectures, assignments, and peer reviews—are often insufficient to meet the diverse needs of students (Andewi & Hastomo, 2022). Many students lack opportunities for personalized and immediate feedback, which is crucial for improving writing skills. Furthermore, students tend to experience anxiety around writing tasks, particularly when they are unsure of their grammar or vocabulary use (Yulistiani et al., 2020). As a result, students' writing proficiency can stagnate, especially when feedback is not promptly or effectively delivered.

To address these challenges, there is a growing interest in incorporating AI technologies into writing instruction. AI chatbots have emerged as promising tools that provide learners with instant, interactive support (Hasbi et al., 2024). Unlike traditional teaching methods, which often focus on general instruction, AI chatbots can offer individualized feedback tailored to each learner’s unique needs. These chatbots can engage students in dialogue, correct errors in grammar and syntax, suggest improvements in vocabulary, and even provide writing prompts or guidance on content organization. Given the potential benefits of AI chatbots, it is important to investigate their impact on writing proficiency in an educational setting.

While there is increasing interest in the role of AI in education, particularly in language learning, research on the specific application of AI chatbots for improving writing skills remains relatively scarce. Most studies on AI and writing have focused on the use of AI tools for grammar correction, vocabulary enhancement, and error identification (Marzuki et al., 2023; Slamet, 2024; Wulyani et al., 2024). However, much of the existing research has primarily been centered on grammar-based AI tools, with little exploration of more advanced AI-driven chatbots like Google Gemini. Moreover, many studies have examined the impact of AI on writing performance in non-university settings or with younger learners, leaving a gap in research regarding university-level students, especially those learning English as a foreign language.

Previous studies have explored the use of AI in language learning with varying degrees of success. For example, AI-powered writing tools that provide real-time feedback significantly improved students' grammatical accuracy and coherence in

writing (Utami & Mahardika, 2023). Similarly, Hakim and Rima (2022) demonstrated that AI chatbots could help improve students' vocabulary and fluency in writing by engaging them in continuous writing practice and offering instant corrections. However, these studies often involved controlled laboratory environments and focused primarily on the mechanical aspects of writing rather than more complex aspects such as content structure, creativity, and argumentation skills.

Moreover, while AI tools are increasingly used to support language learning in various educational settings, there is limited research on the long-term impact of AI on students' writing outcomes. Studies that examine the sustained use of AI chatbots over an extended period are few, and those that do tend to focus on aspects such as motivation and engagement rather than actual writing performance (Hawanti & Zubaydulloevna, 2023; Silitonga et al., 2023). Therefore, this study seeks to contribute to the literature by not only evaluating the immediate effects of using Google Gemini on writing performance but also by considering how students perceive the long-term value of AI in their writing development.

This research also addresses a methodological gap by utilizing a quasi-experimental design in a real-world university setting. Many studies on AI and language learning have employed experimental or non-experimental designs that lack ecological validity, making it difficult to generalize the findings to real classroom contexts. By using a quasi-experimental design, this study incorporates more naturalistic conditions while still providing a rigorous comparison between the experimental and control groups. The inclusion of students from the Sharia Faculty at UIN Raden Intan Lampung also makes this study unique, as it examines the impact of AI in a specific academic context that has not been widely explored in AI research.

Method

Research Design

The quasi-experimental design of this study consists of two groups—an experimental group and a control group—both of which were pre-tested and post-tested to assess changes in writing proficiency (Creswell, 2012). The experimental group utilizes Google Gemini, an AI chatbot, to assist with their writing tasks, while the control group receives conventional writing instruction, which includes in-class lectures, assignments, and peer feedback. The study compares the writing performance of both groups before and after the intervention to evaluate the effectiveness of AI support in improving writing skills.

Since the study is conducted in a natural classroom setting, participants were not randomly assigned to the experimental or control groups. Instead, the groups were pre-existing classes from the Sharia Faculty at UIN Raden Intan Lampung. While this limits the ability to control for certain variables, such as prior writing proficiency, the quasi-experimental design allows for a practical investigation of the intervention’s impact within an authentic educational context.

Participants

The participants of this study were 80 university students enrolled in the Sharia Faculty at UIN Raden Intan Lampung, a public university in Indonesia. The participants

were selected from two undergraduate classes, each consisting of 40 students. The experimental group (Group A) consists of 40 students who will use Google Gemini as part of their writing practice. The control group (Group B), also consisting of 40 students, will receive traditional writing instruction without the aid of AI tools.

The participants were undergraduate students who were studying English as a foreign language. While their English proficiency levels were not uniformly advanced, the students generally had intermediate writing skills, as determined by a pre-study assessment. Their ages ranged from 18 to 22 years, and they were selected based on their enrollment in the Sharia Faculty, where they were required to complete writing courses as part of their academic curriculum.

In order to minimize bias and ensure comparability between the groups, the study only included students who had similar educational backgrounds and who had completed basic English writing courses before the study began. This ensures that differences in writing proficiency could be attributed to the intervention (the use of Google Gemini) rather than prior language exposure.

Instruments

The primary instrument used to measure writing proficiency in this study was a standardized writing test. This test was designed to assess various aspects of writing, including grammar, vocabulary, coherence, task achievement, and overall writing fluency. The writing test consisted of two parts: a prompt-based essay and a short-answer writing task. Both sections were intended to evaluate students' ability to organize and express ideas clearly, use appropriate language, and follow the conventions of academic writing.

At the beginning of the study, both the experimental and control groups completed a pre-test to assess their baseline writing proficiency. The pre-test was designed to gauge the participants' initial ability in writing, and it included an essay on a general topic related to academic writing. For example, one of the essay prompts was "The Importance of Education in Modern Society." Additionally, the pre-test contained a short-answer task aimed at evaluating the students' ability to express ideas clearly and coherently in writing. The results from the pre-test provided a baseline measure of writing skills for both groups, ensuring that any improvements observed later could be attributed to the intervention.

After the intervention period, the participants completed a post-test under the same conditions. The post-test mirrored the format of the pre-test, allowing for a consistent comparison of writing performance over the course of the study. The essay prompt and short-answer task in the post-test were similar in content and structure to those in the pre-test. This consistency ensured that any changes in writing proficiency could be directly attributed to the intervention. Both the pre-test and post-test were scored using a rubric that assessed grammar, vocabulary, structure, and overall task fulfillment. The rubric was adapted from commonly used writing assessment scales in English language learning, such as those used in TOEFL or IELTS, but was tailored to meet the academic writing needs of the participants.

In addition to the writing test, Google Gemini was the primary tool used by the experimental group to support their writing tasks. Google Gemini is an AI-powered chatbot designed to provide real-time feedback on writing. It offers suggestions on grammar, vocabulary, sentence structure, and coherence. Students in the experimental group interacted

with Google Gemini through a web-based platform. They were able to submit their writing tasks to the chatbot, which then provided immediate feedback. This allowed students to revise and improve their drafts based on the suggestions from the AI. In addition to feedback, Google Gemini also offered writing prompts to help students develop their ideas further and guided them through the process of improving their written content.

For the control group, traditional writing instruction was used. This involved regular classroom activities such as teacher-led lectures on writing techniques, peer feedback sessions, and written assignments. The instructor provided general feedback on writing tasks, but unlike the experimental group, there was no AI-based interaction or immediate feedback during the writing process. Instead, students in the control group relied on their instructor's comments and peer feedback to improve their writing. While this traditional approach aimed to help students develop their writing skills, it did not provide the same level of personalized, instant feedback as the AI-supported intervention used with the experimental group.

Data Collection Procedures

Data for this study were collected in two phases: the pre-intervention phase and the post-intervention phase. In the pre-intervention phase, both the experimental and control groups completed the pre-test writing task. This pre-test served as a baseline measure of the students' writing abilities before any intervention took place. The pre-test included an essay prompt and a short-answer task, both designed to assess the students' writing proficiency in terms of grammar, vocabulary, coherence, and task achievement. In addition to completing the pre-test, students in the experimental group were introduced to Google Gemini, the AI chatbot that would support their writing practice. The control group, on the other hand, received a brief orientation on the traditional writing instruction methods they would follow throughout the study. After the pre-test, both groups were given one week to complete their first writing tasks. The experimental group used Google Gemini to receive feedback and make revisions, while the control group completed their tasks under traditional classroom conditions with guidance from the instructor.

During the intervention phase, which lasted for eight weeks, the experimental group utilized Google Gemini for their weekly writing tasks. Each student in this group was required to complete one writing task per week. They interacted with the AI chatbot to receive immediate feedback on their writing, which they could use to revise and improve their drafts. The chatbot provided suggestions related to grammar, vocabulary, sentence structure, and coherence. Meanwhile, the control group continued with traditional writing instruction, which included teacher-led lectures, peer feedback sessions, and written assignments. Both groups had access to their instructor for general guidance and assistance during this period, but only the experimental group benefited from AI-mediated support.

In the post-intervention phase, after completing the eight-week writing practice, both groups were required to take the post-test writing task. The post-test mirrored the pre-test, and the same scoring rubric was applied to evaluate the essays. This allowed the researchers to assess any improvements in writing proficiency from the beginning to the end of the study. Additionally, participants from both groups were asked to complete a short survey to provide qualitative data on their experiences with the intervention. The survey included questions

designed to gauge the students' perceptions of the feedback provided by Google Gemini (for the experimental group) or their satisfaction with the traditional feedback process (for the control group).

Data Analysis

The data collected from the pre-test and post-test writing tasks were analyzed using both quantitative and qualitative methods. For the quantitative analysis, the pre-test and post-test scores were compared for both the experimental and control groups to determine whether there were any significant changes in writing proficiency. A paired-sample t-test was used to assess whether there were significant differences in writing performance within each group (i.e., pre-test vs. post-test) and between the experimental and control groups. This statistical test allowed the researchers to evaluate whether the intervention—specifically the use of Google Gemini—had a measurable impact on students' writing skills.

The qualitative analysis focused on the survey responses collected from the participants. These responses provided valuable insights into the students' experiences with the AI chatbot (for the experimental group) or traditional writing instruction (for the control group). The survey asked students about their perceptions of the feedback they received, their level of engagement with the writing tasks, and how they felt about the effectiveness of the feedback provided. The researchers analyzed the survey data to identify recurring themes related to student satisfaction, perceived usefulness of the feedback, and overall engagement with the intervention. These qualitative insights complemented the quantitative analysis, offering a more comprehensive understanding of the students' experiences and the potential benefits of using AI in writing instruction.

Ethical Considerations

This study was conducted in accordance with ethical guidelines for educational research to ensure that the rights and well-being of the participants were protected throughout the study. Informed consent was obtained from all participants before the study commenced. Participants were fully informed about the nature and purpose of the study, as well as the potential benefits and risks involved. They were assured that their participation was voluntary and that they could withdraw from the study at any time without facing any negative consequences. The study also maintained confidentiality by anonymizing all data collected from participants. Any identifying information was removed to ensure that students' privacy was protected.

Furthermore, the study received approval from the university's ethics committee, ensuring that all research practices adhered to the institution's ethical standards for conducting studies with human participants. By following these ethical protocols, the study sought to create a safe and respectful environment for all participants while ensuring the integrity of the research process.

Results and Discussion

Results

The findings of this study provide insights into the impact of Google Gemini, an AI chatbot, on the writing proficiency of university students. The data collected from

the pre-test and post-test writing tasks, as well as from student surveys, were analyzed to evaluate the effectiveness of AI support in writing instruction. This section presents the key findings based on quantitative and qualitative analyses.

1. Quantitative Findings

Table 1. Results of Experimental and Control Class

Group	Pra-test Mean Score	Post-test Mean Score	Mean Difference	Standard Deviation (Pre-test)	Standard Deviation (Post-test)	t-value	p-value	Effect Size (Cohen's d)
Experimental Class	65.2	78.4	13.2	7.5	6.2	6.5	0.0001	0.8
Control Class	63.5	70.1	6.6	8.1	7.4	3.2	0.002	0.4

The pre-test and post-test results were analyzed to assess the impact of Google Gemini on students' writing performance. The comparison between pre-test and post-test scores for both the experimental and control groups revealed significant differences, suggesting that the intervention had a measurable effect on the writing proficiency of students in the experimental group.

According to Table 1, the experimental group, which used Google Gemini for their writing tasks, showed notable improvement in writing proficiency from pre-test to post-test. The average score of the experimental group in the pre-test was 65.2 out of 100, while the average score in the post-test increased to 78.4. This improvement of 13.2 points was statistically significant, with a p-value of less than 0.05, indicating that the increase in scores was not due to chance. The experimental group demonstrated significant gains in several areas of writing, including grammar, vocabulary, coherence, and task achievement.

One of the most significant areas of improvement was in grammar. Students in the experimental group were able to correct grammatical errors more efficiently with the real-time feedback provided by Google Gemini. Similarly, improvements in vocabulary usage and sentence structure were noted, as students could receive suggestions for more sophisticated word choices and varied sentence structures from the chatbot. Coherence and cohesion also improved, with students developing more logically structured essays. These results suggest that the AI chatbot provided valuable, targeted feedback that helped students refine their writing skills over time.

The control group, which received traditional writing instruction, showed less dramatic improvement. The average pre-test score for the control group was 63.5, while the average post-test score increased to 70.1, representing an improvement of 6.6 points. While this improvement was statistically significant ($p < 0.05$), it was smaller than the improvement observed in the experimental group. Students in the control group showed modest improvements in their writing, but the feedback they received from peers and instructors was less immediate and less specific compared to the AI-based feedback provided to the experimental group. In particular, students in the control group had more

difficulty identifying and correcting their own grammatical errors and improving the overall coherence of their essays without real-time, targeted support.

The comparison between the experimental and control groups indicated that the experimental group benefitted more from the intervention. The effect size, calculated using Cohen's d, was 0.8, suggesting a large effect of Google Gemini on the writing proficiency of students in the experimental group compared to those in the control group.

2. Qualitative Findings

In addition to the quantitative analysis, qualitative data from student surveys provided further insights into their experiences with the intervention. The survey was designed to capture students' perceptions of the feedback provided by Google Gemini (for the experimental group) and traditional writing instruction (for the control group), as well as their overall satisfaction with the writing process.

Students in the experimental group generally reported a high level of satisfaction with Google Gemini. Many students noted that the AI chatbot provided them with immediate and detailed feedback, which helped them to identify and correct mistakes more efficiently than with traditional methods. One student mentioned, "*Google Gemini helped me understand my mistakes better and faster. It pointed out specific areas where I could improve, such as grammar and word choice, and offered suggestions that made my writing sound more natural*."

A common theme among students in the experimental group was the perceived engagement with the writing tasks. Students appreciated the interactivity of the AI feedback, which allowed them to engage in a more dynamic writing process. Several students noted that they felt more motivated to revise their work when they received immediate suggestions for improvement. As one student stated, "*I felt like I had someone to guide me through my writing, and it was easier to make revisions because I knew exactly what I needed to work on*."

However, some students also mentioned that while the AI feedback was helpful, it could sometimes be too focused on surface-level issues, such as grammar and vocabulary, and did not always address deeper issues related to argumentation or the development of ideas. One student shared, "*The feedback on grammar was really helpful, but I wish it gave more advice on how to make my argument stronger or improve my ideas*."

Students in the control group had mixed experiences with the traditional writing instruction. While some students appreciated the in-person feedback from their instructor and peers, many felt that the feedback was less timely and specific than the feedback provided by Google Gemini. One student in the control group remarked, "*It was helpful to get feedback from my peers, but it took longer to get feedback from the teacher. Sometimes, I wasn't sure what to focus on when revising my work*."

Students in the control group also expressed frustration with the lack of real-time feedback. Several students mentioned that they often struggled to make improvements to their writing without immediate guidance. As one student put it, "*It was difficult to*

know if I was on the right track without immediate feedback. Sometimes, I would spend hours working on something and only find out later that I made a basic mistake."

Despite these challenges, some students in the control group reported positive aspects of traditional writing instruction, particularly the collaborative nature of peer reviews. One student stated, "*Peer reviews helped me see my writing from different perspectives, and it was useful to get feedback from other students who were working on similar tasks*."

The overall findings from both the quantitative and qualitative analyses suggest that students in the experimental group, who used Google Gemini, demonstrated more significant improvements in writing proficiency compared to those in the control group. While both groups showed improvements in their writing, the experimental group benefitted more from the AI-mediated support. The qualitative data further highlighted the advantages of real-time, personalized feedback, which students in the experimental group found more engaging and helpful in refining their writing skills.

Additionally, the survey responses revealed that while students in both groups appreciated feedback, the experimental group was more satisfied with the feedback process overall. This suggests that the use of AI tools like Google Gemini can enhance students' learning experiences by providing timely, specific, and interactive support for writing tasks.

Discussion

Several studies have examined the impact of AI and computer-assisted feedback on writing skills, with many showing promising results similar to the findings of this study. For instance, a study by Marzuki et al. (2023) found that AI-powered tools, such as Grammarly, led to significant improvements in students' writing quality by providing immediate feedback on grammar, syntax, and style. This aligns with the present study, where the experimental group showed significant improvements in grammar, vocabulary, coherence, and overall fluency. Just as in their study, the immediate, personalized feedback offered by Google Gemini seemed to play a critical role in enhancing the writing skills of the participants. The ability to identify and correct mistakes in real time allowed students to revise their work more effectively, thereby improving their writing proficiency in a shorter time frame.

Similarly, Waziana et al. (2024) investigated the use of AI tools in writing classrooms and found that students who received AI-mediated feedback showed better task achievement and more coherent writing than those who received traditional teacher feedback. The current study's findings support these conclusions, particularly in the improvement of coherence and task achievement, which were notable in the experimental group. Students in the experimental group in this study reported higher satisfaction with their writing tasks due to the engaging and interactive nature of the feedback. However, unlike some studies, the current research found that students still desired more in-depth feedback on higher-order concerns, such as argumentation and critical thinking. This is consistent with the concerns raised by (Oktarina et al.2024),

who noted that AI feedback is often more focused on surface-level issues (e.g., grammar, vocabulary) and may not sufficiently address higher-order writing elements.

While the results of this study align with previous research in many ways, one distinguishing feature is the extent to which Google Gemini's real-time, personalized feedback appeared to enhance students' motivation and engagement. In contrast to traditional methods, which often involve delayed or generalized feedback, AI tools like Google Gemini provide immediate responses, allowing students to interact with their drafts and refine their work progressively. This finding echoes Silitonga et al. (2023) who highlighted that students who engaged with AI-powered tools exhibited greater motivation to revise their writing. Moreover, the increased engagement in the experimental group, as reported by students in the surveys, aligns with findings by Chen and Chang (2024), who argued that AI systems promote a more dynamic and interactive writing process, thus fostering deeper learning.

Despite the promising outcomes for the experimental group, the control group, which followed traditional writing instruction, also showed improvement, albeit to a lesser extent. This finding is in line with Hastomo (2019), who acknowledged that traditional methods of writing instruction, such as teacher feedback and peer review, continue to play a vital role in improving writing proficiency. The results of the current study reveal that although the control group made progress, the lack of real-time feedback and the reliance on generalized teacher feedback seemed to limit the scope of improvement. Students in the control group expressed frustration over the delayed feedback, which often caused confusion regarding the areas of improvement. This observation aligns with Yu and Liu (2021) who found that students receiving traditional feedback sometimes struggled to apply the feedback in a timely manner, which limited the impact on their writing.

The smaller effect size in the control group (Cohen's d = 0.4) compared to the experimental group (Cohen's d = 0.8) suggests that while traditional instruction is effective, it may not be as impactful as AI-mediated feedback when it comes to significant improvements in writing skills. This contrasts with Acar (2023), who found that traditional feedback, when coupled with effective instructor-student interaction, could lead to improvements comparable to those of AI interventions. However, the present study suggests that the presence of immediate feedback—as offered by Google Gemini—creates a distinct advantage over traditional methods, which often suffer from delays or more generalized guidance.

In terms of student perceptions, the findings of this study also echo previous research on the effectiveness of AI feedback. The majority of students in the experimental group reported high satisfaction with the feedback they received, noting that Google Gemini's immediate and specific suggestions allowed them to make substantial revisions to their writing. This finding is consistent with studies by Waziana et al. (2024) and Oktarina et al. (2024), who found that students using AI tools felt more empowered in their learning process due to the interactive and iterative nature of the feedback. However, it is also worth noting that some students expressed a desire for more comprehensive feedback on higher-order writing issues, such as argumentation and the logical development of ideas. This echoes concerns raised by Slamet (2024),

who pointed out that while AI can be effective at addressing technical aspects of writing, it may not be as adept at providing guidance on complex writing elements such as critical thinking or persuasive strategies.

On the other hand, the control group's perception of traditional writing instruction was more mixed. Although some students appreciated the in-person interaction with peers and instructors, many felt that the feedback was too delayed and generalized to be as useful. As Hasbi and Purnama (2024), while peer feedback and instructor guidance can be valuable, they often lack the immediacy and specificity that AI feedback provides. The traditional feedback process also placed a greater cognitive load on students, as they had to process feedback in separate stages, which could have contributed to the slower improvements observed in the control group.

Conclusion

This study investigated the impact of AI-powered feedback, specifically Google Gemini, on the writing proficiency of university students. The findings indicated that students in the experimental group, who received AI-mediated feedback, showed significantly greater improvements in their writing skills compared to the control group, which received traditional writing instruction. The experimental group demonstrated notable gains in grammar, vocabulary, coherence, and overall task achievement. Students reported high satisfaction with the AI feedback, citing its immediacy and specificity as key factors in their progress. In contrast, while the control group also showed improvement, the feedback was less immediate and lacked the level of personalized guidance provided by the AI, resulting in smaller overall gains.

The implications of this research suggest that AI tools, such as Google Gemini, can be highly effective in enhancing writing instruction by offering real-time, personalized feedback that helps students address surface-level writing issues and improve task completion. However, the study is limited by its small sample size and the focus on one university, which may affect the generalizability of the results. Future research could explore the use of AI in diverse educational contexts, as well as its impact on higher-order writing skills such as critical thinking and argumentation. Given the growing integration of AI in education, these findings support the potential for AI to complement traditional teaching methods and provide a more dynamic, interactive learning experience.

References

Acar, A. S. (2023). Genre pedagogy: A writing pedagogy to help L2 writing instructors enact their classroom writing assessment literacy and feedback literacy. *Assessing Writing*, *56*, 100717. https://doi.org/10.1016/j.asw.2023.100717

Andewi, W., & Hastomo, T. (2022). Effect of Using Flipped Classroom for Teaching Writing Based on Students' Motivation: A Quasi-Experimental Research. *Premise: Journal of English Education and Applied Linguistics*, *11*(3), 615–631. https://doi.org/10.24127/PJ.V11I3.5511

Chen, C.-H., & Chang, C.-L. (2024). Effectiveness of AI-assisted game-based learning on science learning outcomes, intrinsic motivation, cognitive load, and learning behavior. *Education and Information Technologies*, 1–22. https://doi.org/10.1007/s10639-024-12553-x

Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. Pearson Education.

Hakim, R., & Rima, R. (2022). Chatting with AI Chatbots Applications to Improve English Communication Skill. *Journal of English Language Studies*, *7*(1), 121. https://doi.org/10.30870/jels.v7i1.14327

Hasbi, M., Alamsyah, A., Faozan, A., Astawa, N. L. P. N. S. P., Fauzi, A. R., Utomo, H. Y., Devi, A. P., Nor, H., Adimarta, Krtistanto, Mandasari, B., Dewi, R. F., Nisa, B., Hartati, E., Pricilia, G. M., Saputra, R. M., Purnami, I. A. O., Nisa, I. K., Mangendre, Y., … Rohqim, A. (2024). *Useful AI Tools For English Teachers*. Rizquna. http://e-repository.perpus.iainsalatiga.ac.id/21414

Hasbi, M., & Purnama, R. (2024). Reflection of English Language Teaching for High School Students Using E-LISDA E-Learning Platform. *LinguaEducare: Journal of English and Linguistic Studies*, *1*(1), 51–60. https://journal.ciptapustaka.com/index.php/LEC/article/view/6

Hastomo, T. (2019). Schoology Effects on Students' Writing Ability. *Lentera: Jurnal Ilmiah Kependidikan*, *12*(1), 149–154.

Hastomo, T., Mandasari, B., & Widiati, U. (2024). Scrutinizing Indonesian pre-service teachers' technological knowledge in utilizing AI-powered tools. *Journal of Education and Learning (EduLearn)*, *18*(4), 1572–1581. https://doi.org/10.11591/edulearn.v18i4.21644

Hawanti, S., & Zubaydulloevna, K. M. (2023). AI chatbot-based learning: Alleviating students' anxiety in English writing classroom. *Bulletin of Social Informatics Theory and Application*, *7*(2), 182–192. https://doi.org/10.31763/businta.v7i2.659

Marzuki, Widiati, U., Rusdin, D., Darwin, & Indrawati, I. (2023). The impact of AI writing tools on the content and organization of students' writing: EFL teachers' perspective. *Cogent Education*, *10*(2), 1–17. https://doi.org/10.1080/2331186X.2023.2236469

Narayan, S. (2024). Awareness and Familiarity with AI Writing Tools Among Media Students. *LinguaEducare: Journal of English and Linguistic Studies*, *1*(1), 39–50. https://journal.ciptapustaka.com/index.php/LEC/article/view/5

Oktarina, I. B., Saputri, M. E. E., Magdalena, B., Hastomo, T., & Maximilian, A. (2024). Leveraging ChatGPT to enhance students' writing skills, engagement, and feedback literacy. *Edelweiss Applied Science and Technology*, *8*(4), 2306–2319. https://doi.org/10.55214/25768484.v8i4.1600

Ramadhanti, A., Nurchurifiani, E., Octafiyana, A., Safitri, A., Sari, L. P., & Hastomo, T. (2024). The Influence of STAD Method Towards Students Writing Ability in Recount Text. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature*, *12*(1), 13–24. https://doi.org/10.24256/ideas.v12i1.4014

Silitonga, L. M., Hawanti, S., Aziez, F., Furqon, M., Zain, D. S. M., Anjarani, S., & Wu, T. T. (2023). The impact of AI chatbot-based learning on students' motivation in English writing classroom. *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, *14099 LNCS*, 542–549. https://doi.org/10.1007/978-3-031-40113-8_53

Slamet, J. (2024). Potential of ChatGPT as a digital language learning assistant: EFL teachers' and students' perceptions. *Discover Artificial Intelligence*, *4*(1), 46. https://doi.org/10.1007/s44163-024-00143-2

Utami, I. G. A. L. P., & Mahardika, I. G. N. A. W. (2023). Grammarly and grammatical errors reduction: A case for non-native English teachers' professional learning. *International Journal of Language Education*, *7*(2), 227–240. https://doi.org/10.26858/IJOLE.V7I2.46431

Waziana, W., Andewi, W., Hastomo, T., & Hasbi, M. (2024). Students' perceptions about the impact of AI chatbots on their vocabulary and grammar in EFL writing. *Register Journal*, *17*(2), 328–362. https://doi.org/https://doi.org/10.18326/register.v17i2.352-382

Wulyani, A. N., Widiati, U., Muniroh, S., Rachmadhany, C. D., Nurlaila, N., Hanifiyah, L., & Sharif, T. I. S. T. (2024). Patterns of utilizing AI–assisted tools among EFL students: Need surveys for assessment model development. *LLT Journal: A Journal on Language and Language Teaching*, *27*(1), 157–173. https://doi.org/10.24071/llt.v27i1.7966

Yu, S., & Liu, C. (2021). Improving student feedback literacy in academic writing: An evidence-based framework. *Assessing Writing*, *48*, 100525. https://doi.org/10.1016/j.asw.2021.100525

Yulistiani, E., Supriyono, S., Wicaksono, A., & Hastomo, T. (2020). The Correlation between Vocabulary Mastery, Reading Habits, and The Students' Writing Ability. *IJLHE: International Journal of Language, Humanities, and Education*, *3*(1), 69–76.